

**TOPSOIL, WEED, DIEBACK AND REVEGETATION
MANAGEMENT PLAN**

**South Western Highway
Donnybrook Townsite to Thomsons Hill Section**

October 2006

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DONNYBROOK SOUTH AND BROOKHAMPTON REALIGNMENT

REVEGETATION MANAGEMENT PLAN

1. PROJECT DESCRIPTION

1.1 Purpose

This document sets out the topsoil, weed and dieback management actions and revegetation plan for the Donnybrook Townsite South and Brookhampton Realignment projects of South Western Highway. Main Roads Western Australia (MRWA) has a policy aim to “protect and enhance the environmental values of road reserves”. In the process of establishing new roads and upgrading existing roads, there is often a need to undertake revegetation of the road reserve or other affected areas.

The purpose of this plan is to identify effective revegetation practices that help accelerate the natural succession processes that occur following the clearing of native vegetation and soil disturbance.

1.2 Background

MRWA Southwest Region have considered that the southern approaches of the South Western Highway to Donnybrook are in need of upgrading for the past 5 years. However, due to conflicting demands they have been deferred until last financial year when works started north of Donnybrook. The current works are for the Donnybrook Southern approach and the Brookhampton Realignment. The main stakeholders regarding the proposed clearing and revegetation program are the Shire of Donnybrook and various adjacent landowners. The Department of Conservation and Land Management (CALM) are the managers of two conservation areas (State Forest and Reserve 2013) that are adjacent to the project however no clearing is required on this side of the road reserve.

CALM completed a dieback assessment of the project area in July 2006 and GHD are currently undertaking an Environmental Impact Assessment and Management Plan (EIAMP) for the Project.

1.3 Project Description

Aerial photography of the project areas has been provided for the Donnybrook South SLK 186.5 to 188.3 (Attachment 1) and Brookhampton Realignment SLK 189.4 to 192.8 (Attachment 2) sections of the project.

There are no proposed works between SLK 188.3 to 189.4.

1.4 Existing Environment

1.4.1 Vegetation

A majority of the road reserve and adjacent land of the project has been previously cleared (parkland cleared) for agricultural purposes. Remnant vegetation (*Eucalyptuys marginata* - *Corymbia calophylla* forest) is located in the following locations;

- Adjacent to Reserve 2013 to the west of the Donnybrook Townsite South section
- Adjacent to State Forest area west of the Brookhampton Realignment section opposite Thomson Road

- Directly north of Thomson's Road east of the Brookhampton Realignment section

Approximately 35 Grasstrees have been located within the existing road reserve between the Barecca's Winery and Brookhampton Road (Brookhampton road Realignment section). Some of these Grasstrees are located within the clearing footprint required for the project and shall be transplanted during revegetation works.

1.4.2 Weeds

The following weed species are known to occur in the project area:

- *Sorrel*
- *Annual grasses (e.g. Barley, Love Grass, Wild Oats and Rye Grass)*
- *Watsonia*
- *Lavender*

1.4.3 Dieback

The Department of Conservation and Land Management completed a dieback survey to determine the presence of dieback (*Phytophthora cinnamomi*) in the project area and to identify Protectable Areas (Attachment 3). It was determined that the areas with indicator species present were infected with Dieback (adjacent to Reserve 2013 and State Forest). The remaining areas of the project lacked any susceptible indicator species to determine the presence of dieback and were therefore uninterpretable. These areas are also considered unprotectable due to the presence of dieback in the surrounding area. Standard dieback management actions will be sufficient to control dieback during the proposed works.

1.5 Other Considerations

The EIAMP currently being prepared by GHD may include environmental factors and management actions that shall be undertaken during rehabilitation and rehabilitation works. For example, the presence of declared rare or priority flora may warrant restricted access during revegetation works.

2. TOPSOIL MANAGEMENT

2.1 Vegetation clearing, mulching and re-use

Native and other vegetation to be cleared from the works area shall be chipped and stockpiled for re-use in rehabilitation. Burning of the cleared vegetation shall not be permitted within the road reserve.

Several potentially dangerous stag trees have been identified east of SLK 187200 – 187330. If determined dangerous, these stags shall be removed.

Effort shall be made to retain several planted mature Callistemon bushes located east of SLK 188100 and 188200.

2.2 Topsoil stripping and re-use

Topsoil will be stripped to a maximum depth of 100 mm and managed according to Table 1. Topsoil may be placed in windrows of less than 1m in height and re-spread (100mm depth) on revegetation sites as soon as possible or carted to spoil at an approved site. In areas where suitable weed free topsoil is not available, topsoil can be substituted with gravel as a growing medium. Mulching will take place after topsoil spreading.

Topsoil in the Donnybrook South section will either be stockpiled and respread or carted to spoil (Attachment 4) while all topsoil on the Brookhampton Realignment section will be respread on site.

Table 1. Topsoil Management

Stockpile Separately	Section	Direction	Start SLK	End SLK	Topsoil Management
	Donnybrook South	East	186500	187100	Respread topsoil
		East	187100	187320	Cart topsoil to spoil
		East	187340	187700	Cart topsoil to spoil Rip, windrow and respread old road base
		East	187700	188320	Respread topsoil
		West	186500	187230	Respread topsoil
*		West	187320	188100	Windrow and respread conserved topsoil on cut embankment
		West	188100	188320	Cart topsoil to spoil
	Brookhampton Realignment	East	189400	190810	Respread topsoil on areas that shall not be revegetated
*		East	190810	191010	Windrow and respread conserved topsoil
		East	191010	191390	Respread topsoil
		East	191400	192700	Respread topsoil to create mowed road verge (5:1) taking care not to damage direct seeded sites or herbicide boundary of these sites
		East	192700	193000	Topsoil shall be respread to create mowed road verge (5:1) away from sites to be planted
		West	189400	193000	No

* Indicates topsoil to be stored separately in the most suitably weed free area, as close as possible to the area to be rehabilitated, to avoid additional weed infestation.

2.3 Soil treatment

The areas that will be revegetated through planting will be ripped (Min depth of 700mm) and mounded to loosen compacted soil, allow for effective weed control and to create an ideal medium for root development and will be undertaken during dry conditions.

2.4 Removal of Rubbish

The rubbish located east of SLK 187500-187600 and west of SLK 188100-188200 shall be removed before revegetation works.

3. WEED CONTROL

All machinery working in the project area shall be washed down and inspected prior to entering and leaving the project site to ensure it's free of all soil and vegetative material.

Weed control is essential for the successful establishment of revegetation sites. Some form of weed control will be required on all sites to be revegetated. Scalping and disposal (i.e. cart to spoil) of weed infested topsoil may be desirable. Several applications of herbicide spraying (prior and post planting) will be required for areas to be planted. Herbicide spraying shall not be carried out during windy conditions to minimise spray drift.

Where works are adjacent to good quality vegetation, weeds within the project area are to be selectively removed.

Annual selective weed control programmes will be required until control is achieved at the following location;

1. Weed control boundaries (1-2m) shall be established around all direct seeding plots between SLK 191400 and SLK 192700.

4. DIEBACK CONTROL

Only necessary vehicles will be allowed access to the project area. Off-road access will be restricted to hard, well drained tracks to avoid the accumulation of mud. Prior to arrival and departure to the project site all machinery, plant, equipment, tools and footwear will be cleaned down to remove all soil and vegetative material that may carry the pathogen. Cleaning may include; brushing, gouging, scraping, jetting with compressed air or high pressure water system. It is desirable that cleaning occurs on hard, well drained surfaces (e.g. road) rather than the bush.

All vegetation and soil shall be stockpiled on-site to avoid the spread of the pathogen. If the disposal of soil or vegetative matter is required it shall be at an approved dieback infected site.

Unnecessary soil movement and erosion will be avoided. Earth moving activities will be restricted to dryer conditions to prevent the further spread of the pathogen.

Plants will be purchased from nurseries with Nursery Industry accredited to prevent the introduction of other diseases. Planting will occur when the soil is moist but not wet.

5. REVEGETATION

5.1 Revegetation Objectives

The roadside vegetation should be similar in structure and content to naturally occurring vegetation in the local area while meeting the following objectives:

- Ensure roadside stability and minimise ongoing maintenance;
- Ensure safety requirements are met,
- Ensure that conservation values and biodiversity is protected; and
- Ensure local amenity and aesthetics are enhanced.

The vegetation cover will help to prevent soil erosion by rainfall impact and surface water flows, improve visual amenity and provide additional habitat for flora and fauna.

5.2 Specific Revegetation Considerations

Several driveways enter the Donnybrook Townsite South and Brookhampton Realignment sections. Revegetation shall not be undertaken where there is a potential to obstruct lateral or vertical clear zones required for appropriate visual clearance at all driveways.

Several Geodetic Markers will be installed on both the Donnybrook Townsite South and Brookhampton Realignment sections. Revegetation shall avoid all sites where there is a potential to interfere with the operation of Geodetic Markers.

Telstra and other services shall be relocated prior to construction of the project. Their location shall be identified to ensure damage to all services are avoided and to minimise ongoing maintenance (i.e. no trees planted underneath overhead power lines).

5.3 Areas of revegetation

Table 2 (Attachments 4 and 5) details the areas and methods that require revegetation

Table 2 Revegetation Sites

Section	Direction	Start SLK	End SLK	Revegetation method	Area
Donnybrook South	East	187190	187310	Direct seed and mulch fill embankment	100m x 5m = 500m ²
	East	187480	187600	Direct seed into old road base	80m x 10m = 800m ²
	East	187700	187800	Consultation with the Champignon's is required to determine what revegetation and/or transplanting works are required.	
	West	187250	187610	DS and mulch cut embankment	(area to be determined approx 4m wide – trip meter to get length)
Brookhampton Realignment	East	?	?	Consultation undertaken with the Barecca's is detailed in Section 6 and their requirements have been incorporated into Table 2 and Attachment 5.	
	East	191400	192700	Infill planting or additional seeding may be required in previously seeded sites,	Varied

5.4 Revegetation Species

Revegetation may be undertaken using the species listed in Table 3. This list is based upon the species list used for the direct seeding sites south of Brookhampton Road and species observed in the surrounding vegetation and the Department of Environment and Conservation's list of dieback susceptible species. It is recommended this list is updated when the flora survey of adjacent vegetation has been completed.

Table 3. Species List

SPECIES	COMMON NAME	HEIGHT	DIEBACK SUSCEPTIBLE
ACACIA EXTENSA	Wiry wattle	1-2m	N
ACACIA DENTIFERA		3m	N
ACACIA LATERICOLA		1.5m	N
ACACIA PULCHELLA	Prickly Moses	3m	Y
AGONIS FLEXUOSA	Willow myrtle	10m	N
AGONIS LINEARIFOLIA	Swamp Peppermint	4m	N
ALLOCASUARINA HUMILIS	Dwarf casuarina	2m	Y
ANIGOZANTHOS MANGLESII	Red and Green kangaroo paw	1m	N
BANKSIA GRANDIS	Bull banksia	8m	Y
BOSSIAEA ORNATA	Broadleaved Brown Pea	1m	Y
CALOTHAMNUS QUADRIFIDUS	One-sided bottlebrush	1m	N
CALOTHAMNUS RUPESTRIS	Mouse Ears	4m	N
CHORIZEMA ILICIFOLIUM	Holly Flame Pea	0.5m	N
CORYMBIA CALOPHYLLA	Marri / red gum	30m	N
EUCALYPTUS MARGINATA	Jarrah	40m	Y
EUCALYPTUS RUDIS	Flooded gum	20m	N
HAKEA LISSOCARPA	Honeybush	1.5m	N
HARDENBERGIA COMPTONIANA	Native Wisteria	climber	N
HYPOCALYMMMA ROBUSTUM	Swan River Myrtle	1.5m	Y
KENNEDIA COCCINEA	Coral Vine		N
JACKSONIA STERNBERGIA	Stinkwood	5m	N
JUNCUS KRAUSSII	Sea Rush	1.2m	N
JUNCUS PALLIDUS	Pale Rush	2m	N
KENNEDIA PROSTRATA	Scarlet Runner		N
KUNZEA ERICIFOLIA		4.5m	N
LECHENAULTIA BILOBA	Blue Leschenaultia	0.5m	N
MELALEUCA HUEGELLI	Chenille honey myr	2m	N
MELALEUCA INCANA	Grey swamp shrub	2m	N
MELALEUCA LATERITIA	Robin redbreast bu	4m	N
MELALEUCA PREISSIANA	Paperbark	7m	N
MELALEUCA RHAPHIOPHYLLA	Swamp paperbark	10m	N
MELALEUCA THYMOIDES	Sand wattle mytle	1m	N
MELALEUCA UNCINATA	Broom Bush	0.5 - 5m	N
MELALEUCA VIMINEA	Mohan	3m	N
PATERSONIA OCCIDENTALIS	Purple Flag	1.1m	Y
PATERSONIA UMBROSA	Yellow Flag	0.9m	Y
TAXANDRIA LINEARFLOIA		5m	N
XYLOMELUM OCCIDENTALE	Woody Pear	8m	Y

Below is a suggested list of species that should be used, but not exclusively, in the revegetation sites.

Berecca's Winery – upper and lower storey species

- Marri – *Corymbia calophylla*
- Jarrah – *Eucalyptus marginata*
- Swamp Peppermint – *Taxandria linearifolia* (previously known as *Agonis linearifolia*)
- Broad Leaved Brown Pea – *Bossiaea ornata*
- Swan River Myrtle - *Hypocalymma robustum*
- Pale Rush – *Juncus pallidus*
- Sea rush – *Juncus kraussii*

Fill Embankment (SLK 187190 – 187310) - shrubs only

- Broad Leaved Brown Pea – *Bossiaea ornata*
- Maybe? Swamp Peppermint – *Taxandria linearifolia* (previously known as *Agonis linearifolia*)
- Swan River Myrtle - *Hypocalymma robustum*
- *Jacksonia sternbergia*

Cut Embankment (SLK 187480 – 187600) – brightly flowering lower storey

- Broad Leaved Brown Pea – *Bossiaea ornata*
- Coral Vine - *Kennedia coccinea*
- Blue Leschenaultia – *Lechenaultia biloba*
- Purple Flag – *Pattersonia occidentalis*
- Swan River Myrtle - *Hypocalymma robustum*
- Wattle - *Acacia lateriticola*

5.5 Revegetation Techniques

5.5.1 Direct seeding

The following rehabilitation works shall be undertaken on areas requiring revegetation through direct seeding;

1. Herbicide spraying of weeds to be undertaken well in advance of any seeding works. The timing of sprays depends upon the species of weeds present and more than one application may be required.
2. Remove weedy topsoil to a minimum depth of 100mm via scalping if required.
3. Premix 1 part approved topsoil with 2 parts approved mulch
4. Spread mulch/topsoil to a minimum depth of 70mm
5. Area to be ripped to a minimum depth of 200mm with rip lines 300mm apart
6. Determine correct quantities and species mix
7. Apply seed just before the break of the season, usually between April to June, when first winter rains fall
8. Vermiculite or a similar product is to be used to bulk up the seed mix to ensure even distribution over the site
9. Seed is to be evenly broadcast over the site via hand or mechanical method
10. Incorporate seed and stabilise topsoil into the site by running swamp tracked machine over the soil surface
11. No works are to be undertaken on the site after this time
12. Implement monitoring regime to ensure weeds do not become re-established

5.5.2 Rip mound planting

The following rehabilitation works shall be undertaken on areas requiring revegetation through rip/mound planting;

1. Herbicide spraying of weeds is to be undertaken well in advance of any planting works. The timing depends upon the species of weeds present and may require more than one application.
2. Rotary hoe the area to be ripped and mounded to remove large soil aggregates
3. Rip to a minimum depth of 500mm with rip lines 300mm apart
4. Mound (traversing all slopes) to a minimum height of 500mm (soil will settle to 300mm) with 2m spacings apart
5. Apply mulch over mounds to a minimum depth of 70mm
6. All mounds to be treated with a pre-emergent herbicide
7. Determine correct numbers and species mix of seedlings to be planted
8. Plant seedlings after the break of the winter season between May to July when the soil is slightly moist
9. Insert one industry standard slow release fertiliser tablet approximately 200mm deep and 200mm from the roots with every seedling planted
10. Implement monitoring regime to ensure weeds do not become re-established

5.6 Transplanting

Where appropriate transplanting of desirable plants shall be undertaken (e.g. Grasstrees and Christmas Trees) to preserve the biodiversity and visual amenity values of these species within the road reserve. Lifting and temporary storage of targeted species will be carried out prior to clearing operations. Transplanting will be undertaken by a suitably qualified person.

Approximately 38 Grasstees have been located between Berrecca's Winery and Brookhampton road on the eastern side of the alignment. Approximately 20 of the most suitable and likely to survive Grasstrees will be transplanted in the locations indicated in Attachment5.

6. CONSULTATION

Consultation has been undertaken with the following landowners due to the concern they expressed over the future revegetation works to occur along the alignment and in front of their properties. Further consultation will be required with both parties during the construction and revegetation phase of works.

Barreca's

On Wed 27th September A/PMD Brett Lowcock and GEnv Joann Johnston visited Fil and Toni Barreca to discuss their concerns for the road reserve in front of their property. Their main concern was maintaining visual frontage to attract customers to their winery. Their wish was to have the minimum amount of vegetation screening their property as possible and to ensure water discharging from culverts was obstructed by vegetation before running onto their properties. The Barreca's own two properties adjacent to each other and will therefore require two access points onto South Western Highway. It was also agreed that Main Roads would transplant several grasstrees (the number is yet to be decided) to emphasise the Barreca's winery if they would ensure watering over two consecutive summers.

On Fri 29th September GEnv Joann Johnston and PM Alan Grist presented a revegetation plan (Attachment 6) to the Barreca's which minimised revegetation in front of their property to several 20-30m long revegetation plots in front of all culverts and opposite all driveways. Revegetation species discussed included sedges, rushes, Melaleucas and Flooded Gums to

create infiltration basins / constructed wetlands to capture all runoff discharged by each culvert.

Watering requirements for transplanted grasstrees were also discussed (i.e. approximately 25L of water per grasstree twice weekly over the summer months).

The Barreacas were very pleased with this arrangement.

Campagnoni

Fri 29th September GEnv Joann Johnston and PM Alan Grist talk to Anna and Toni Campagnoni regarding weed control, transplanting grasstrees/rose bushes and revegetation outside of their property. Further consultation is required regarding revegetation works with these landowners.

7. VEGETATION ESTABLISHMENT PERIOD

The vegetation establishment period will be for at least two years following the completion of the works.

8. ONGOING MAINTENANCE AND MONITORING

Maintenance and monitoring of the project shall be ongoing to measure regeneration effectiveness and ensure weed infestations are controlled or eliminated.

8.1 Monitoring

After project completion, revegetated areas will be inspected every six months for the first two years to ensure weed spread or establishment has not occurred and to measure effectiveness of revegetation works.

Areas containing known weeds shall be monitored weekly during project construction to ensure spread/development of weeds are minimised. If weeds are observed an appropriate treatment plan (spraying, removal, burning etc.) will be developed and implemented to ensure the weeds are eradicated.

Monitoring will comprise the use of input criteria. Essentially, this involves visual assessment to ensure the revegetation works have been implemented as planned. Table 1 shall be used as the monitoring guide to assess the success or otherwise of the revegetation plan.

As the project is located in an area that has variable rainfall patterns, it is recognised that regardless of the amount of effort put into the revegetation, success cannot be guaranteed. Proper management only ensures rehabilitation success when adequate rainfall does occur.

Table 4. Monitoring Requirements

Criterion	Target	After three months	After one year	After three years
Mean vegetation foliage cover (%) excluding weeds	>75	NA	50	60
Mean weed foliage cover (%)	<10	<10	<10	<10
No. of bare soil areas >4m ² (%)	<10	<30	<20	<10
Species richness (%)	>90	60	70	>80
No. of erosion gullies greater than 200mm in depth (%)	<10	30	20	<10

9. REFERENCES

Dieback Working Group (2005). Managing Phytophthora Dieback in Bushland. WWF Australia.

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